

A HORTITHERAPY PROGRAM FOR THE  
VISUALLY HANDICAPPED

by

Phyllis Robinson Gilreath



Horticulture Department

The South Carolina Agricultural Experiment Station  
Clemson University  
Clemson, South Carolina

L. P. Anderson  
Dean of Agricultural Sciences

W. C. Godley  
Associate Dean & Director  
Agricultural Research

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The value of horticulture in the education and rehabilitation of the visually handicapped has only recently been recognized for the vocational and therapeutic benefits which may accrue. A well planned horticultural therapy program can provide these benefits. Such a program can not only open the door to a new interest which may lead to a promising career, but hortithery also helps the unsighted develop a broader understanding of nature, his environment, and his role in the total scheme of things.

Horticulture encompasses all areas of plant growth and care. With proper instruction it was thought that horticulture related activities could prove effective as tools both for the rehabilitation, and the reeducation and training of individuals with a visual handicap. A research project was thus initiated at the South Carolina School for the Deaf and Blind in Spartanburg, S. C.

Various horticultural activities taken into the classroom were observed and their feasibility for such a program was evaluated as determined by student interest and ability. Based on these sessions, detailed lesson plans were compiled giving instructions in each activity as well as special techniques and considerations for their use with the unsighted.

Out of this activity program emerged a need for a simple descriptive guide to aid the blind in the identification of common houseplants. To be most effective such a manual should also include methods of propagation as well as unusual features of the plant.

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As student interest increased, it was thought that a garden on the school grounds could prove beneficial for the enjoyment as well as the education of both sighted and unsighted students. A garden designed for such a purpose would be an excellent teaching aid as an area where the students' developing interest in plants could be further enriched and expanded.

With these considerations in mind, the following objectives were proposed for this research project:

- 1) To compile information on existing programs providing horticultural training for the visually impaired in a classroom or institutional setting;
- 2) To develop lesson plans for ten activities which could be used in a horticultural therapy program for the visually handicapped, and to test the feasibility of these activities in a classroom situation;
- 3) To formulate a descriptive guide to the identification of house-plants which, in braille form, could aid unsighted individuals in recognizing plant materials;
- 4) To design a Hortitherapy Garden to be utilized by the sighted and the unsighted as an area for both relaxation and enjoyment and for teaching.

## LITERATURE REVIEW

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Although it has received little fanfare in either the medical or horticultural worlds, horticultural therapy has recently become a highly respected and widely practiced discipline. Conklin (35) cites the long-recognized value of horticultural therapy as coinciding with his belief that "not only do plants need man's care to develop best, but man also requires direct contact with plants to develop and retain a mental wholeness". Hortitherapy has been defined as "the use of horticultural appeal and methods for improvement of physical and mental well-being" (36). Odom (34) states that horticultural therapy is probably the oldest of the activity therapies, yet it is the last to be given professional status. It has developed not as a distinct therapy but as a form of treatment to be used in conjunction with other types of therapy (40).

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In the early part of the eighteenth century it was found that gardening was of benefit to the ill as a diversional therapeutic activity to help keep patients from dwelling on their troubles. In 1798, Benjamin Rush proclaimed that "digging in the soil had a curative effect on the mentally ill" (40). As early as 1806 Spain was emphasizing the benefits of horticultural activities to mental patients. Outdoor work in the garden was also being used as a method of treatment at the Pennsylvania Hospital in Bethlehem and other hospitals (40).

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In the twentieth century, increased use was made of horticultural therapy in the treatment and rehabilitation of disabled World War I soldiers. More extensive use of these activities was made during and after World War II, frequently with more emphasis in the areas of greenhouse work and vegetable gardening (40).



Previously termed garden therapy, the word "horto-therapy" was coined in 1945 by Richardson Wright, and it was not until 1948 that it was actually called "horticultural therapy" (40).

During the early fifties, emphasis was being placed on hortitherapy programs and activities for specific types of patients (40). Since then, programs have rapidly become established across the country. Successful programs have been launched at The Menninger Clinic, Topeka, Kansas (34); Highland Hospital, Asheville, North Carolina (13); Friends Hospital, Philadelphia, Pennsylvania (16); and the Melwood Horticultural Training Center, Upper Marlboro, Maryland (22).

While the specific goals of any horticultural therapy program may differ significantly from one population to another, the ultimate goal remains the improvement of physical and mental health. Hefley (22) also states that "the benefits may be seen in four areas - intellectual, social, emotional, and physical development".

Plants are nondiscriminating, responding to the care of the gardener regardless of his real or imagined handicap. According to McCandliss (32),

It is not always the plant that is more important.  
It is sometimes more important that someone has  
been exposed to new knowledge, a new hobby,  
a new awakening to the world in which he lives,  
a new way to socialize and relate to others, new  
goals and achievements shared with others.

Today horticulture and horticultural teaching face perhaps their greatest challenge in keeping abreast of society's changing needs (34). As well as providing therapeutic and rehabilitative benefits, successful and innovative horticultural therapy programs can widen the career potentials of many handicapped groups - including the blind (14).

To fully understand the role of horticulture in the training and rehabilitation of the unsighted, we should first take a look at blindness itself. An individual is considered legally blind "if his central visual acuity does not exceed 20/200 in the better eye with correcting lenses or his visual field is less than an angle of 20 degrees" (5). In the United States alone, some 6.4 million individuals are afflicted with some kind of visual impairment. Of this number, 1.7 million are severely impaired with 400,000 having no usable vision at all (5). The visually handicapped are from every strata of society, including "the intellectually gifted and the mentally retarded, the multiply disabled and the emotionally disturbed" (8). The main goal in working with such individuals is to help them overcome problems imposed by a visual impairment in order to function successfully in a sighted world (8).

Unemployment is the most crucial problem confronting the blind. This situation is linked to the problem of providing proper vocational training. The three leading industries employing the blind are trade, manufacturing, and agriculture. It would seem apparent that a vocational program should be based on these occupations. Howeiller (24) suggests that agricultural education for the blind could feasibly be provided by state institutions.

The development of organized education for the blind has been slow, dating back to 1784 when the first school for the blind was opened in Paris by Valentin Haüy (5). Their founders looking to Europe for special appliances and methods, the first schools for the blind in the United States were opened in the early 1830's in New York, Philadelphia, and Boston (27).

Perhaps the most important contribution to the education of the blind was the development of what is known today as braille. Braille is

a system of touch reading for the Blind which employs embossed dots evenly arranged in quadrangular letter spaces or cells. In each cell, it is possible to place six dots, 3 high and 2 wide (4).

These various combinations of dots stand for the letters of the alphabet, numerals, and punctuation (27). This system was initiated by Louis Braille in Paris in 1834, but it was not until the 1850's that it enjoyed its first acceptance in the U. S. at Missouri's School for the Blind (21).

Founded in 1858, the American Printing House for the Blind in Louisville, Kentucky, remains today the largest publishing house and manufacturer of special devices for the aid of the blind (15). Today, many educational materials are available for use by the unsighted. These are in the form of braille books and magazines, cassette books, talking books, and open reel magnetic tapes. A few of the selections include such topics as flower and vegetable gardening, houseplants, pruning, and landscaping (6).

New ideas in instructional materials for the blind are also being developed by Adapting Science Materials for the Blind (ASMB). Its purpose is "to provide an experience-centered instructional program in science for visually impaired elementary school children" (9). Students plant seeds and water their own plants. By feeling their growth and development, they can thus experience the life cycle of a plant (9). By providing such experience it is hoped that the educational and developmental retardation so often found with blind children will be removed (39).



In the rehabilitation of the newly blinded, Hutchinson (25) emphasizes the importance of getting them to use their hands and sharpen perception through the other senses. Offering opportunities to develop manual dexterity is the first step in helping them develop the all important sense of touch. Handling articles of various shapes, materials, and weights may help to enhance this sense (25). Halward (18) advocates the benefits of gardening techniques as an aid in the identification of shapes, smells, and sizes. He states that gardening can be enjoyed using seed planting and other propagation techniques which allow the unsighted to plant and transplant. Stevens (38) states that "with the sense of touch the blind gardener probably excels his sighted colleague". Many of the problems encountered can be overcome with special devices such as a template with spaced holes to fit over seed boxes ensuring even sowing of seed. He also suggests the use of liquid dispensers marked in braille which aid in the correct measurement of insecticides, etc. (38). Dr. Hugh Findlay of Columbia University has designed and developed special tools for the blind to allow them to garden more independently (40).

Fruits and vegetables are excellent in sensory discrimination activities for teaching the unsighted to use the senses of taste, touch, and smell. The touch and smell of such things as flowers, leaves, and pine are also good for developing the senses (21).

Bryan (9) advocates the use of field trips in which the blind are brought in tactual and olfactory contact with many varieties of plants. The smell and touch of bark, leaves, seed, fruits, and flowers are useful tools in identifying plants (9).

Hutchinson (25) suggests having the blind plant the bulb of a fragrant flower so he can tend it as it grows. This interest can be expanded to growing herbs in a

window box or tending a garden. She states that farming is one occupation in which visually handicapped persons have excelled, with many taking complete charge of their gardens.

According to Newcombe (33) horticultural activities for the unsighted can also serve as a basis for mathematical computations and vocabulary development.

The goals in the rehabilitation of an unsighted individual are to help him "achieve independence, usefulness, and personal fulfillment" so that he may develop and carry out a realistic educational or vocational plan (8). By means of science education, either in a high school or college situation, some attractive vocational opportunities are suggested to the blind, such as "a greenhouse floriculturist" (9).

Horticultural training for the visually handicapped has been practiced in some form in many parts of the world. In teaching blind Africans to farm, Carter (12) found they were more interested in fruits and vegetables than ornamentals. He attributes this to shape and taste. In India, farming is practiced by the blind in a village at Tata. In Ethiopia there have also been some programs in raising certain crops (23).

In England, interest in gardening among the blind community has increased considerably during the past few years as evidenced by the Guild of Blind Gardeners with a membership of well over 1000. There also exist three clubs of blind gardeners whose members have even exhibited their produce at local flower and vegetable shows with some success (38).

In the United States, horticultural therapy was taken into the classroom in Chicago public schools maintained for handicapped children. In classes of blind

students, it was used to stimulate interest in greenhouse activities and outdoor gardening by planting seeds, making stem cuttings, and arranging cut flowers (40).

In 1955, a program of Greenhouse and Nursery Training for the Blind was established at the Georgia Academy for the Blind to enable sight handicapped persons to achieve the same horticultural objectives as persons with unimpaired sight. This program grew out of a shortage of jobs for visually handicapped persons. These students "learned, physically and psychologically, to become useful employees for many of the usual tasks in greenhouses and nurseries" (14).

A 1963 project of the Virginia Commission for the Visually Handicapped solidly confirmed that agriculture is indeed "a possible and feasible vocation for legally blind persons" (3). Since 1971 approximately 15 blind clients of the Virginia Vocational Rehabilitation Department have been successfully placed in employment as farmers, gardeners, and florists (20).

In 1974, a program was initiated by the South Carolina Commission for the Blind which consisted of formal vocational horticulture instruction and placement. All phases of horticulture are touched upon. Their success is demonstrated by the fact that almost 50% have been placed in horticulture related jobs (1).

The Ohio School for the Deaf extended their vocational horticulture program to partially sighted students in 1974. According to Newcomb (33), those enrolled "have a tremendous desire to succeed in Horticulture". Measures of success in this program include: 1) enjoyment - sense of personal importance, 2) development of salable skills, and 3) jobs and success. Other benefits besides the career exploration function involve helping the students broaden their cultural experiences and associations with the environment around them (33).



In the specialized training of the blind for horticultural hobbies and vocations, many see practical use which can be made of the so-called "gardens for the blind" (7). Burgess (11) advocates that gardens designed with facilities for the blind "should serve as an enticement to them to search out other gardens and further encounters with the botanical world".

"Horticulture came before Agriculture, and the garden itself came before both" (29). The word horticulture taken literally means the culture of the garden. Lees (29) states that a garden is "outdoor space organized for man's use, comfort, and pleasure".

While crops of early gardens were most certainly edible and a little later, medicinal, the type of ornamental garden we are concerned with here is a product of a more urbanized civilization. Since the first makers of gardens were ancient Mesopotamians, it is likely that here originated the first gardens designed for pleasure as well as profit (26).

The American Foundation for the Blind, in a policy statement concerning gardens for the blind, stated that:

such facilities and experiences should be available to all persons in the community including visually impaired persons and not set aside or designated for the enjoyment of one special group (2).

They believe these specialized areas carry a distasteful psychological impact, and only help to perpetuate negative stereotypes of the visually impaired (2).

While the creation of gardens for the blind does not win universal approval of associations for the blind as well as of some blind individuals, they nevertheless continue to grow and their numbers increase. In fact, there are some who are very

enthusiastic about "the creation of a separate place, a playground for the sense of touch and smell" (11).

The first area in the U. S. designed primarily to serve the unsighted was at the John T. Tyler Arboretum in Lima, Pennsylvania. When it was constructed in 1949, plant materials were selected for fragrance or flavor, hardiness, and ease of maintenance. The common names of these plants were stamped in braille on copper plaques (40). According to Bryan (10), it is "essential to have labels in close proximity to the plant they describe".

The Helen Keller Fragrance Garden was located at the Alabama School for the Blind and Deaf in Talladega. It has the advantage of being located where it is well visited by students. Featuring benches, raised beds, braille labels, guide rails, and a pool with a fountain, this garden was designed "to completely round out the activities of these children while they attend the institution" (28).

The Brooklyn Botanic Garden added a fragrance garden in 1955 for the blind and the sighted. Beds were raised for easier access to plants. The four main categories of plants found in this garden are those of aromatic foliage, unusual texture, fragrant flowers, or herbs with taste (37).

The Fragrance Garden at the Norfolk Botanical Gardens was opened in 1963. Signs in both braille and Arabic offer names and season of bloom of plant specimens. According to Burgess (11), it is important to choose plants for their interest in all seasons.

In 1965 a Garden of Fragrance was constructed in Golden Gate Park in San Francisco. It features plants at touching level, braille signs, and 80 varieties of plants grouped as to texture, aroma, and flavor. The touching of plants is

encouraged as a water feature is provided for rinsing strong plant aromas from the fingers (31). Watson (40) advocates the noise of water falling into a pool as a pleasant addition to such an area.

In the spring of 1969, the Touch - and - Smell Fragrance Garden was opened in New York City. A pioneer in the development of such facilities in an urban environment, it was tailored to meet the needs of the blind with elevated beds, a guiderail bearing plant names in braille, and plants with fragrant foliage or flowers and distinct tactile characteristics (41).

In 1969, the Living Historical Gardens were established at the Clemson University Horticultural Gardens. Consisting of the pioneer complex and the wildflower and bog garden, braille labels point out interesting features of the plants as well as early pioneer buildings and farm implements (18). It provides an enjoyable as well as an educational experience for the sighted and the unsighted alike (36).

Hove Garden near Brighton, England, is one of the finest in the world serving approximately 300 blind individuals in the community (40).

Sunlight Camp in Scituate, Massachusetts, is a camping area which has raised flower beds and guarded pathways. Supervised study is part of the program and unsighted campers are encouraged to make cuttings and root them to learn more about plants (40).

Fragrance gardens are located at other places including Fort Worth Botanical Gardens in Texas; the Garden for the Blind on W. Roosevelt Road in Chicago; Toronto, Canada; and Vienna, Austria. Such gardens also exist at summer camps for the blind at Bedford, New Hampshire; Egypt, Massachusetts; Spring Valley, New York; and Macon, Georgia (11).



The ultimate goal of these gardens is "to develop an increasing knowledge and awareness of man's natural environment" (17). Visitors are encouraged to come into closer contact with nature through their other senses. Droege (17) believes that "opening the wide and fascinating world of nature to the blind and handicapped in our society has barely begun".

## MATERIALS AND METHODS

In order to determine current numbers and types of horticultural programs for the blind, letters were sent in January of 1976 to various schools, institutions, and rehabilitation centers serving the blind throughout the United States. Information was requested concerning location of such programs, relevant teaching materials available, and job opportunities.

Contact was made with the American Foundation for the Blind to obtain necessary background information on the visually handicapped in general. Further information was obtained by attendance at the second annual conference of the National Council for Therapy and Rehabilitation through Horticulture in October, 1974, and by participation in Hortitherapy Workshops held at Clemson University. Contacts were made and ideas exchanged with other individuals involved in hortitherapy programs.

A meeting was held in the spring of 1975 with the principal of the South Carolina School for the Deaf and Blind and a teacher of his selection to determine the possibility of instituting horticultural training in the classroom. This is a state residential school for the blind, although its numbers include some day students. The school serves a population of approximately 650 deaf, blind and aphasic individuals.

Because of the nature of this study, a science class was chosen for the development of a horticulture program. The class consisted of seven students, but only four voluntarily participated. All were considered legally blind although two students had some traveling vision.

An introductory activity session was then held to get acquainted with the students and teacher. From observations and student reaction a list of horticultural activities was compiled which would be attempted during the course of the program.

A regular schedule was established and in the fall of 1975 weekly trips were made to the school for a series of twelve weeks, with each session averaging one hour in length. At each meeting, a new horticultural activity was introduced, directions were explained, and the students were then allowed to complete the activity by themselves. Observations were made and recorded based on: 1) ease or difficulty of the task, 2) amount of assistance required, and 3) student response to the activity. Further student response was acquired by means of a questionnaire administered after the program was terminated. On occasion it was necessary to rework an activity and present it again because of initial difficulty with one or more of the skills involved.

From August 1975 to January 1976, a descriptive houseplant guide was prepared, using the plant descriptions of a blind assistant who was trained in horticulture. This guide includes approximately 55 of the most common plants, many of which were utilized in the program. After discussion with the students and teacher, it was decided that methods of propagation should be included to make it more useful to the student. It was then edited to a form which could be suitably transcribed into braille.

In October of 1975 it was brought to the author's attention that space in a newly constructed portion of the school had been set aside for some type of garden area. Adjoining the recreational facilities, this area was studied and analyzed and it was found that this would be a suitable location for a Hortitherapy Garden. This



garden would be designed to fulfill the needs of all the students attending the school. The plant materials were to be selected for their texture, fragrance, color, and hardiness, and would be labeled in braille and in Arabic. This area would serve a dual purpose as a recreational and educational facility.

## RESULTS AND DISCUSSION

### Preliminary Investigation

Responses were received from letters of investigation mailed to schools, rehabilitation centers, and other agencies serving the blind. Of the 118 letters sent out, 53 replies were received with varied responses. Of these, 7 reported existing programs which offer some type of horticultural training or instruction to the blind. These include programs sponsored by the S. C. Commission for the Blind, the Georgia Academy for the Blind, the West Virginia School for the Deaf and Blind, the Governor Morehead School, the Talladega Rehabilitation Institute, Bucks County Association for the Blind, and the Florida Rehabilitation Center for the Blind (Table I). Six responses indicated either an interest in establishing such a program or had tentative plans for working horticulture into their present curriculum (Table II). Seven contacts reported that they provided similar services for unsighted individuals in horticultural training either through on-the-job training or in regular universities or vocational schools.

The remaining agencies indicated either no knowledge of training programs of this type which are currently available, no interest in such a program, or no knowledge of hortitherapy. Reasons given for the absence of programs included lack of interest, a shortage of job opportunities for the blind, and a lack of qualified instructors.

Concerning information received on job opportunities, it was found that nurseries, greenhouses, and florists have been contacted by various organizations. They expressed an interest in employing persons who are legally blind providing there is an opening and the employee has had some training.

Table 1. Organizations reporting established horticulture training programs serving the visually handicapped in the United States.

Organization	Location	Type of Program
S. C. Commission for the Blind	Columbia, South Carolina	6-12 months formal instruction in fruits, vegetables, flowers, ornamentals, greenhouse operation, and processing.
Georgia Academy for the Blind	Macon, Georgia	Greenhouse and nursery training. Also offers a class in horticulture for high school students enrolled at the Academy.
West Virginia School for the Deaf and Blind	Romney, West Virginia	Prevocational and vocational programs for partially sighted students in Floriculture and Landscaping.
Governor Morehead School	Raleigh, North Carolina	9-month program of classes in horticulture for visually impaired high school students, covering general horticulture topics.
Talladega Rehabilitation Institute	Talladega, Alabama	12-18 month training program in greenhouse and nursery management, and grounds maintenance, serving mostly partially sighted clients. The totally blind are geared toward sales jobs.



Table 1. (Cont'd.)

Organization	Location	Type of Program
Bucks County Association for the Blind	Newton, Pennsylvania	Clients evaluated for 4-16 weeks in horticulture as part of the total rehabilitation program. Actual horticulture training is 20-40 weeks of instruction in all phases including greenhouse and nursery management and retail sales.
Florida Rehabilitation Center for the Blind	Daytona Beach, Florida	Training and classes offered in greenhouse management and floral design as part of the general rehabilitation program.

Table II. Organizations in the United States indicating an interest in forming a horticulture training program for the visually handicapped.

Organization	Location
Virginia School at Hampton	Hampton, Virginia
Olympia School for the Blind	Olympia, Washington
Michigan Rehabilitation Center for the Blind	Kalamazoo, Michigan
Missouri School for the Blind	St. Louis, Missouri
Idaho State School for the Deaf and Blind	Gooding, Idaho
Tennessee School for the Blind	Donelson, Tennessee

Other contacts stated that employment opportunities are limited because many horticulture employers are not willing to hire a blind individual without training. These results further substantiate the need for horticulture education and training for the blind.

The author is of the opinion that the poor response obtained was due to the small number of existing programs of this type, therefore those contacted had no relevant information to offer.

### Development of Hortitherapy Program

Based on discussions with the students it was determined that none had any previous horticultural training. Two of the students, however, had assisted in the planting and care of small vegetable gardens at their homes.

Students ranged in age from 17 to 22. Four volunteered to participate in the program. This number created a problem in that observations had to be made on such a small sample. Of the classes and students screened, the class chosen for participation was found to have the largest percentage of functionally blind individuals which was desirable for the purpose of this study.

At the introductory session, an edited lesson plan in braille was given to each student as an instructional guide. This was a satisfactory method, but was not practical for this study because of the limited time factor. For this reason, the format was revamped and oral instruction was given by the therapist and an un-sighted horticulture assistant. This proved very successful as the blind assistant was better able to identify with the problems encountered resulting from the student's handicaps.



Participation during each session was good. Because each activity was a new experience, students showed an active interest and eagerly awaited the therapists' arrival. It is interesting to note here that the 3 students who initially showed no interest and refused to participate in the activities were actively requesting to join the hortitherapy group during the latter sessions. It is also significant that one of the 4 initial participants was giving instructions to these 3 students after he himself had learned a new skill. This shows a development of socialization, one of the benefits of horticultural therapy as advocated by McCandliss (32).

Students were often surprised to learn they would be able to keep the final product of their efforts. Such items as terrariums and dish gardens were given away with pride as gifts they had made themselves. Odom (34) states that great satisfaction can be obtained from the simple joy of giving plants.

Participants were pleased with the work they had done and relished the praise of their peers. According to Odom (34), gratification and a feeling of accomplishment and pride in one's work are important end products of this type of therapy.

Through the questionnaire administered after this study was terminated, it was found that all of the students questioned expressed an interest in attending additional horticulture classes; while 50% of those questioned stated they would be interested in a career in a horticulture related field.

#### Limitations Encountered in Establishing the Hortitherapy Program

In the short period of time allotted for this study, one class period per week, it was difficult to spend a sufficient amount of time with each student on individual activities in order to draw valid conclusions. Also, over such a short time span,

it was difficult to note significant changes in the students' behavior as a result of experience in a horticultural therapy program.

Another problem involved the small number of participants. To obtain significant results a larger group of at least ten individuals is desirable.

The distance traveled to meet with the students also proved to be a hindrance to the overall program. It would be desirable to meet with a group in a location where more contact could be made with the participants for longer periods of time. Also, working around the schedule of a school is difficult, as most suspend classes during the summer, decreasing the time available to make contact with the students and interrupting the continuity of the program.

### Activities

#### Media and Soil Mixing

This is very good as an initial activity when establishing a horticulture program. It gives the student an opportunity to get accustomed to working with a very basic element, the soil. By encouraging use of the hands as tools for mixing, the students more easily overcome their hesitancy to "get their hands dirty". This activity is also good for development of manual dexterity and the sense of touch by means of discriminating between materials of different weight, texture, and size (18, 24).

#### Plant Propagation

These activities included propagation by seed, herbaceous and softwood stem cuttings, and leaf cuttings. Although this activity was not one of immediate gratification, students enjoyed 'watching' the flats daily for the first seedling to emerge or the first roots to form. Students acquired patience and learned to accept

the fact that they seldom attained 100% success with this activity. Acceptance of disappointment is an important lesson attributed to this activity by McCandliss (32).

The use of a guide stick is a convenient tool for keeping rows straight when sticking cuttings. Other problems may be overcome by the use of similar special devices to aid in such techniques as the even distribution of seed (38).

Studying seeds of different shape, size, and texture aid students in developing a keener sense of touch (25). By including problems such as formulating percent germination, students gain experience in mathematical computations (33).

### Transplanting

In performing this skill, students must exercise extreme care so as not to damage small seedlings or the fragile roots of cuttings. This activity has been advocated by others as a successful means of increasing the dexterity of the hands and fingers which is important in enhancing the sense of touch (19, 25). When space is available, a vegetable garden planted from the students' seedlings would be a good learning activity for the benefits of the physical work involved as well as the inclusion of resultant vegetables in sensory activities (12, 21, 25, 38).

### Terrariums and Cactus Dish Gardens

Terrarium construction was one of the most successful and enjoyable activities. Besides offering the individual an opportunity to draw upon his imagination and creativity, the end result gave immediate gratification. The use of wide mouth containers is essential because the student must be able to work freely with his hands in order to place plants in the desired locations.



### Dried Flower Activities

In drying plant materials and placing them in arrangements, students learned to better appreciate their natural environment and the beauty that can be found in common weeds and plants. They also came to the realization that there is a wealth of materials within their reach which can be easily utilized for these activities.

Although making dried flower arrangements was not completely successful, particularly with totally blind students, it did offer a chance for self-expression which is an important result (22).

### Potpourri

This activity created a great deal of interest and proved very popular. This is attributed to stimulation of the sense of smell by the various ingredients used. It is good to have students remove the petals from the flowers as an exercise in dexterity. They may also examine the flowers as they work as an aid in future identification (10).

### Hanging Baskets

This was a very simple activity which did not offer enough challenge for the more capable students. One benefit of this activity resulted from the chance to use plants the students had rooted themselves. This afforded even more pride in the finished product. Some students even began analyzing the commercial potential of such items as hanging baskets and terrariums, inquiring about the types of jobs one could perform.

### Horticulture Related Activities

Plant identification exercises were implemented on plants used as stock plants for cuttings. Students were instructed in the different characteristics to look for, such as stem and leaf shape and texture. Other characteristics were also emphasized including the smell of flowers and leaves which is suggested by others working with a blind population (10, 21).

A tour of the Pioneer Complex and Wildflower and Bog Garden at Clemson University's Horticultural Gardens was an educational experience for the students. They were exposed to new plant materials as well as being given the opportunity for a meaningful exposure to their natural environment.

The tour of Clemson University's greenhouses aroused many questions as students were exposed to the culture of many varieties of plants on a large scale. Tours of commercial greenhouses and nurseries would also be applicable to this population.

### Development of Lesson Plans

Activities which would be useful in a horticultural therapy program for the unsighted were put into the form of detailed lesson plans. These state the goals of each activity, the materials needed, and an outline of instruction for teaching the lesson as well as special techniques or ideas which may be beneficial. These lesson plans were designed primarily for use by individuals without a horticultural background. They are samples and should not limit the material covered, as other activities should be included for a complete, well rounded program.

Student performance in each activity was observed on the basis of the following criteria:

1. ease or difficulty of the task
2. amount of assistance required
3. student interest and response

Observations and reactions, when applicable, are given at the end of each lesson plan. Specific objectives were omitted as these would vary according to the ultimate goals of the participants, whether vocational, avocational, rehabilitative, or therapeutic.

A sample lesson plan has also been provided which was edited and transcribed into braille (Figure 1). In a program where time is not such a limiting factor, these could be included successfully as instructional guides.

#### Development of Descriptive Guide

A descriptive guide to the identification of houseplants has been compiled. Utilizing the sensory language of the unsighted, it is a basic format consisting of leaf and stem characteristics, flower and berry characteristics when applicable, and any other distinguishing features of the 57 plant specimens. Only the most noticeable characteristics which would aid an unsighted individual in identifying the plant were included. A number of common terms used in the guide and their meanings were listed, and methods of propagation were given for each plant.

This guide is based on the descriptions of one blind individual. From previous research, Floyd (18) found that the descriptions given by a single blind person were adequate for a taxonomic guide which would be acceptable as well as usable. Student reaction to several of the plants was observed to determine if the descriptions as given would provide a workable guide. Success was attained with the assistance of the blind horticulture aid.



TRANSPANTING

MATERIAL -

1. PLANT MATERIAL - ROOTED

SEEDLINGS OR CUTTINGS

2. POTS - PEAT , CLAY OR

PLASTIC WITH GOOD DRAINAGE

3. MEDIA - STANDARD , SUCCULENT

OR COMMERCIAL MIX

4. TROWELS

5. WATERING CONTAINER

FILL POT WITH SOIL TO WITHIN

Figure 1. Sample Lesson Plan in Braille



ONE INCH OF TOP.



MAKE A HOLE IN THE SOIL



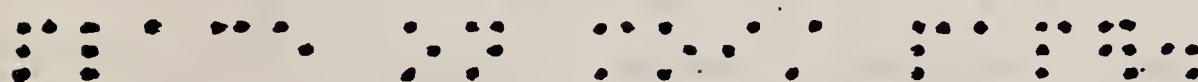
WITH FINGER. TO REMOVE SEEDLINGS



DIG UNDER PLANTS WITH THE FINGERS.



LIFT OUT A SMALL BUNDLE AND



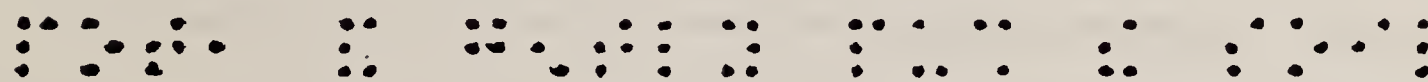
PLACE ON MOIST PAPER.



CAREFULLY SEPARATE THE PLANTS.



PLACE ONE PLANT IN EACH



POT, AND GENTLY PUSH THE SOIL


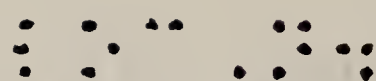


AROUND THE STEM AND ROOTS. WATER



THOROUGHLY. PLACE IN A WELL-

Figure 1. (Cont'd.)



  
 LIGHTED LOCATION.





  
 REMOVE ROOTED CUTTINGS











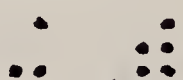




  
 THE SAME WAY. FILL THE POT





  
 HALF FULL OF SOIL. PLACE






  
 ONE CUTTING IN EACH POT AND




  
 FINISH FILLING WITH SOIL.





  
 WATER AND PLACE IN LIGHT.

Figure 1. (Cont'd.)



It is hoped that in the future, this guide, or an expanded version of the initial guide, will be of use in a horticulture class for the unsighted at the S. C. School for the Deaf and Blind. A sample of the descriptive guide in braille is included (Figure 2).

### Development of Hortitherapy Garden

A Hortitherapy Garden has been designed for the S. C. School for the Deaf and Blind. This garden includes features which make it suitable for use by all the students on the school campus for their enjoyment and education. Raised beds, at varying heights, accommodate several species of plant material selected on the basis of color, texture, fragrance, and hardness.

Plants will be labeled in braille and Arabic on signs at a convenient height, presenting common and scientific names as well as season of bloom when applicable. This is in agreement with information offered by Burgess (11). Students at the school will assist in the labeling of plant material. The garden also includes benches for relaxation. A water feature consisting of a fountain and pool was also incorporated into the garden design as advocated by Watson (40). The tentative completion date for the construction of the Hortitherapy Garden is April 1976.

It is hoped that it will provide an area where students can enjoy a closer contact with nature and their environment. It may also serve as an excellent teaching area for instructing students in horticultural topics such as plant materials and plant maintenance.

Landscape plans for this garden are included (Figure 3). Drawings have been photographically reduced by approximately one-half. The scale, as given, corresponds to the original drawing.

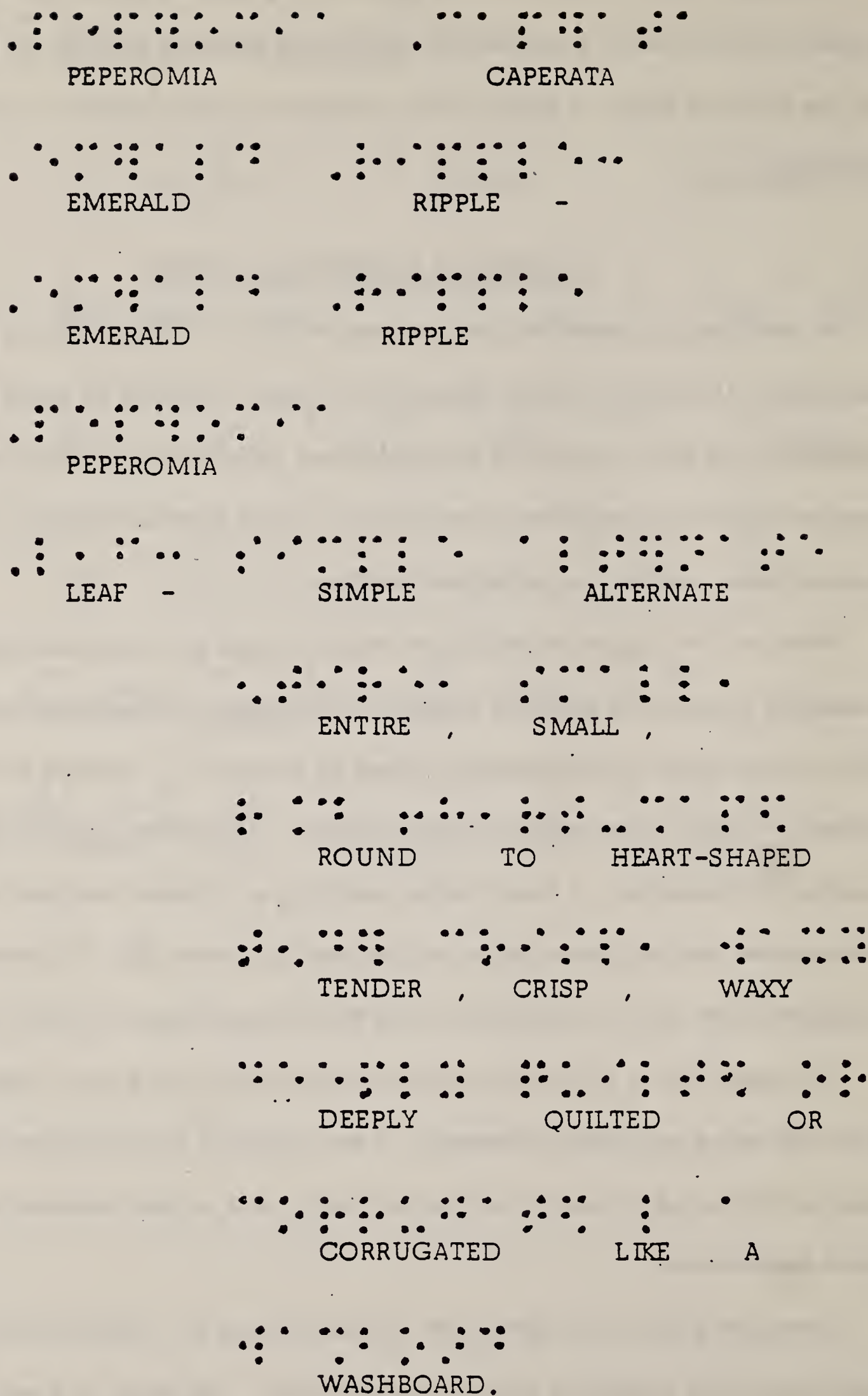


Figure 2. Sample of Descriptive Guide in Braille

PETIOLE - SMOOTH, SLICK

ROUND, VERY LONG

STEM - SMOOTH, VERY SHORT

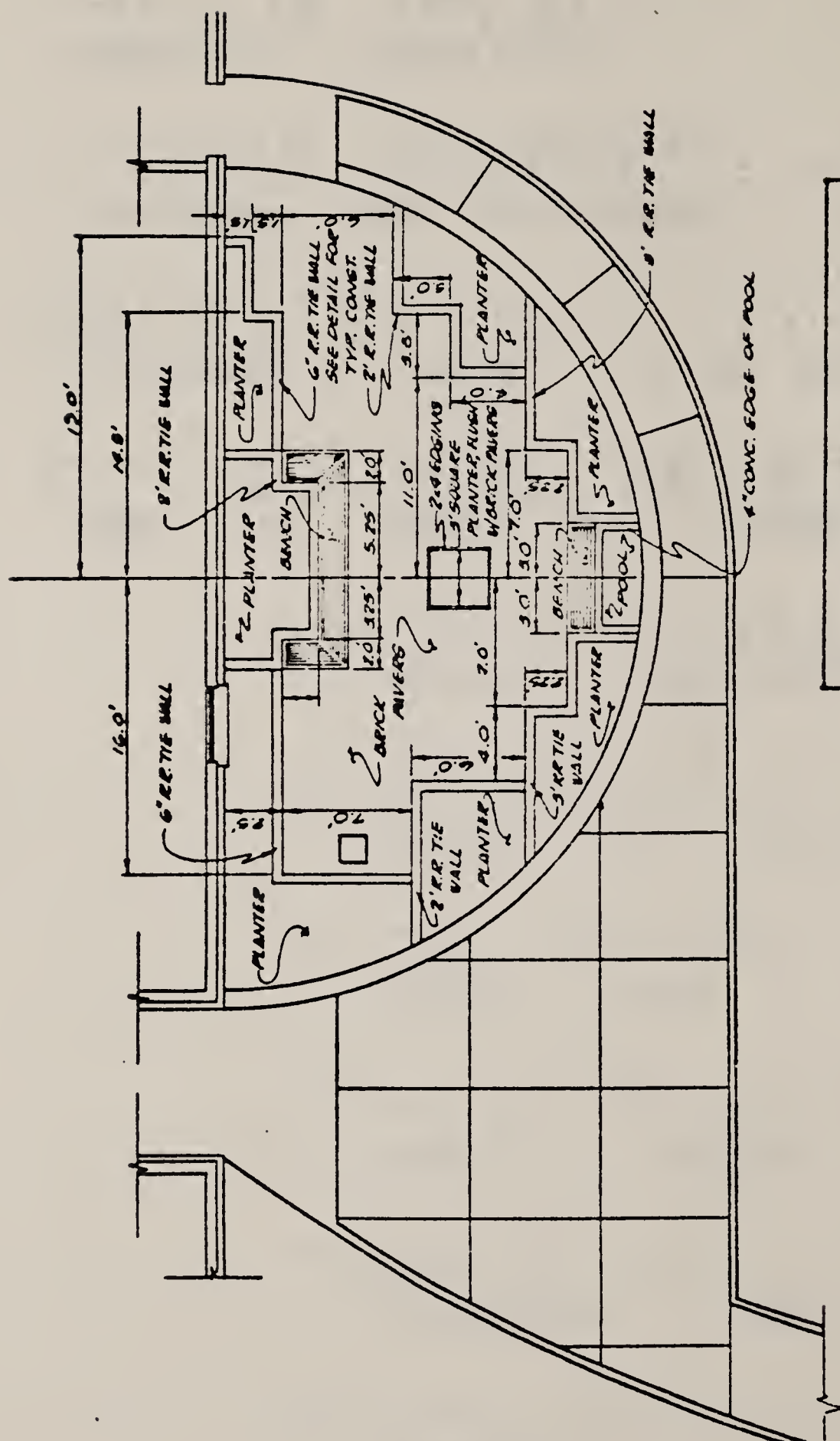
THIS IS A SMALL PLANT

PROPAGATED BY LEAF OR STEM

CUTTINGS.

Figure 2. (Cont'd.)





**Figure 3. Hortitherapy Garden Landscape Plan**

# HORT THERAPY GARDEN

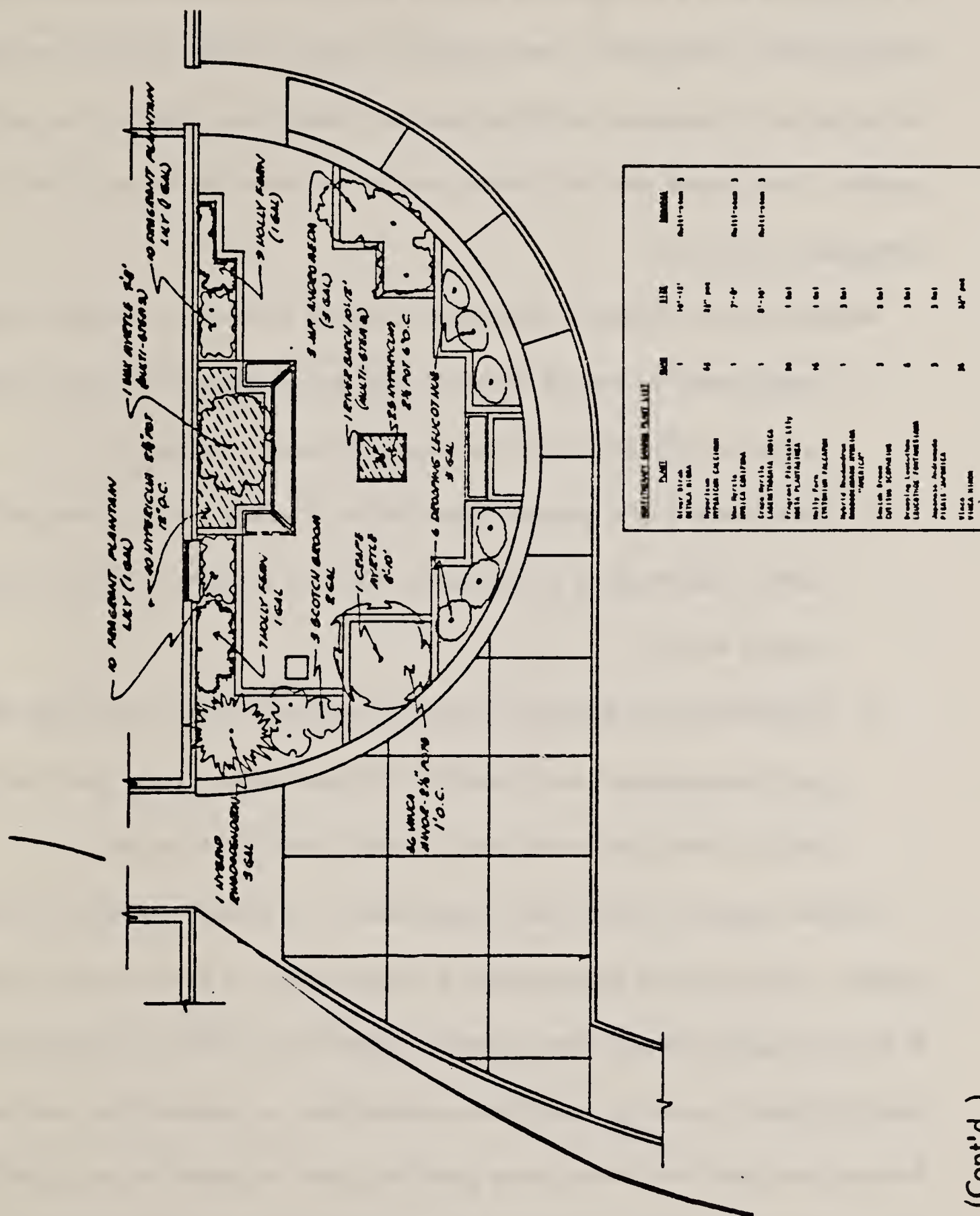
SOUTH CAROLINA

SCHOOL FOR DEAF AND BLIND

Spartanburg, S. C.

SCALE: 1" = 5'

PHYLLIS GILREATH d. 1911



## SUMMARY AND CONCLUSIONS

Through investigation into current horticulture training available to the blind, it is apparent that a horticultural therapy program could prove beneficial as a rehabilitative, therapeutic, and vocational tool in working with the unsighted. By initiating such a program, with the resultant lesson plans, descriptive guide, and garden, it was found that the interest and the potential of the unsighted is virtually untapped in this area.

Benefits to the visually handicapped accruing from such a program include:

1. Improvement of manual dexterity and the all important sense of touch, as well as stimulation of other modes of sensory perception.
2. Development of a greater appreciation of nature with a consequently better understanding of his role in the total scheme of things in the natural world.
3. Establishment of feasible vocational opportunities in helping the blind gain independence and the self-fulfillment which comes from feeling one is a more productive and successful member of society.

Further research in this area is warranted. It is recommended that in future studies, contact should be made with a larger number of participants, if possible. It is also suggested that a more scientific approach be taken with experimental and control groups in order to make better comparisons and substantiate conclusions. Pre and post tests in relevant areas could be given to determine any significant changes which could be attributed to these horticulture or horticulture related experiences.



This research has shown that horticulture skills acquired in a hortitherapy program are beneficial tools for the therapeutic and vocational rehabilitation and training of the visually handicapped.

# College of Agricultural Sciences

DEPARTMENT OF HORTICULTURE

CLEMSON  
UNIVERSITY

January 14, 1976

Dear Sirs:

I am in the process of writing a master's thesis on the value of a horticultural therapy program for the visually impaired. My research was carried out at the South Carolina School for the Blind where, with the aid of a blind assistant, I instructed students in various horticultural skills. I am trying to collect information on horticultural training programs available for these individuals in schools, rehabilitation centers, etc., and job placement in this or related areas.

Do you have any information concerning training programs or classes of the type I have described, or training materials (books, cassette tapes, etc.) which are available? Also, what type of job opportunities exist for these individuals in horticulture? Any information would be greatly appreciated.

As I am attempting to compile a listing which is as current as possible, I have waited until now to make such inquiries. I would, therefore, appreciate a reply at your earliest convenience. Thank you very much.

Sincerely,

Phyllis R. Gilreath  
Graduate Assistant  
Horticultural Therapy Program

PRG:jsb

CLEMSON, SOUTH CAROLINA 29631 • TELEPHONE 803 656-3403

APPENDIX A: FORM LETTER SENT TO ORGANIZATIONS IN THE UNITED STATES

Phyllis R. Gilreath  
Graduate Research Assistant

December 15, 1975

### HORTITHERAPY QUESTIONNAIRE

1. Do you like plants? \_\_\_\_yes, \_\_\_\_no.
2. Are there any plants in your home, either indoors or in an outdoor garden? \_\_\_\_yes, \_\_\_\_no.
3. Have you had any previous experience working with plants, indoors or outdoors? \_\_\_\_yes, \_\_\_\_no.  
If yes, please explain in detail.
4. Which activity in this program, excluding tours, did you enjoy most?  
\_\_\_\_\_ Why?
5. Which activity did you enjoy the least? \_\_\_\_\_  
Why?
6. Which activity did you find most difficult to complete? Explain.
7. Do you feel that this horticulture program has increased your interest in this area?
8. Would you be interested in attending classes to further your knowledge of horticulture?
9. Do you feel you might be interested in employment in a horticulture related field (Greenhouse, nursery, florist, etc.) now or possibly in the future?
10. Other comments or criticisms of this program.

APPENDIX B: QUESTIONNAIRE ADMINISTERED TO STUDENTS PARTICIPATING  
IN THE HORTITHERAPY PROGRAM



## APPENDIX C. LESSON PLANS

### Lesson Plan 1: Media and Soil Mixing

#### Goals:

1. To introduce the student to various types of soil mixes and their respective uses.
2. To help the student become familiar with the different components of these soil mixes.
3. To teach the student the proper procedures in mixing media using correct proportions for the desired mix.
4. To help the student overcome his initial reluctance to work with the soil and 'get his hands dirty'.

#### Materials:

1. Media --
  - a. soil - a good sterilized garden loam is desirable
  - b. sand - clean, white sand may be obtained from builders supply companies
  - c. peat moss - added to increase the water holding capacity and organic matter of the soil
  - d. vermiculite - its porous structure and ability to absorb water make it desirable
  - e. perlite - increases the aeration of the mix
  - f. commercially prepared potting mix - usually contains peat, vermiculite or perlite, and enough nutrients for initial plant growth

2. A tub, wheelbarrow, or large container for mixing.
3. A large scoop or container for measuring -- a 3-gallon container is good.
4. Trowels -- used in mixing the soil although it is suggested that students be encouraged to use their hands.

#### Method:

The soil should first be screened to remove roots, grass, rocks, and other extraneous material. This may be done by sifting the soil through a large mesh hardware cloth mounted on a wooden frame. The soil may be sterilized in an autoclave, if one is available, or by placing in shallow pans in a 200°F oven for two hours.

Fill the measuring container with each component to be added, according to the ratio needed for that particular mix. Two of the soil mixes most often used are the standard mix, composed of 1 part soil, 1 part peat, and 1 part sand or vermiculite, and the succulent mix which contains 1 part soil, 1 part peat, and 2 parts sand. The standard mix can be used for potting most plants such as vegetables, houseplants, etc. The succulent mixture is good for cacti and other succulent plants as it affords better aeration and drainage.

Cuttings may be rooted in sand, vermiculite, or perlite, although combinations of these often give better results.

Commercial mixes are often used because of their ready availability in most stores or garden centers. They can be used for potting plants and vegetables, in making terrariums, and planting seed.

Comments:

In teaching the student to recognize and identify these materials, it is advisable to emphasize the weights and textural differences. For example, vermiculite is in spongy layers and sand is coarse and heavy. Other significant properties include the ease or difficulty in wetting. Commercial mixes are often hard to wet. Peat becomes heavy when wet.

In measuring the materials, emphasize the fact that volume proportions are used rather than weight proportions.



## Lesson Plan 2: Sexual Propagation

### Goals:

1. To introduce the student to sexual propagation and the different types of plants which can be grown from seed.
2. To help the student become aware of the differences in size, shape, and texture of the various seeds as an aid to seed identification.
3. To teach the student how to prepare media for seeding and the correct procedure for sowing seed.

### Background:

Sowing seeds is probably the most frequently used method of propagation. Seeds may be planted directly outdoors in the ground, as with most vegetable crops, or they may be sown indoors and when the seedlings are large enough they can be transplanted in the field or in successively larger containers as their root systems become more developed.

### Materials:

1. Containers -- standard flats may be used or other inexpensive items such as milk cartons cut in half.
2. Media -- the standard mix or a commercial mix may be used. Peat pellets are also useful for sowing seed. These are wafers of compressed peat which expand when soaked in water.
3. Newspapers or clear plastic bags.
4. Seeds -- suggested seeds include marigold, impatiens, cactus, tomato, and black-eyed peas. There are many others which may be used.

Method:

Fill the container with a pre-moistened soil mix and smooth the surface. Broadcast the seed as evenly as possible over the surface and cover with a thin layer of soil, about  $\frac{1}{4}$  to  $\frac{1}{2}$  inch, depending on seed size. If desired, large seed may be planted in rows made with a stick or the finger. When sowing very small seed, such as impatiens or petunias, it is helpful to mix the seed with dry sand, thus allowing for more even distribution. These small seed should not be covered with soil.

Place a layer of damp newspaper over the tray, keeping the paper moist until germination begins. The paper is then removed and the seedlings are carefully sprinkled with water as needed. A sprinkling bottle or can is suitable.

When using peat pellets, soak them in water for about 20 minutes until fully expanded. They may then be placed in a tray and the seed planted in the opening at the top. When seeding in peat pellets, cups, etc., it may be helpful to remove one from the tray. As the seeds are planted, continue moving the one just completed into the empty space. Always work from left to right or from right to left. This has proven successful in helping the student locate where he last planted. Place two or more of the smaller seed or one of the large seeds in each pellet, pressing them gently into the soil. Cover the seeds lightly with soil and cover with a damp newspaper. The flats of seed may be placed in plastic bags as a substitute for newspaper. The plastic should be removed upon germination and the seedlings kept moist with adequate light for growth.

The trays may be placed under a mist system if one is available, covering with paper to prevent washing of the seeds and the soil.

Comments:

As the seeds are planted, encourage the student to examine them closely, noting the differences in size, shape, and texture. For example, tomato seeds are flat and fuzzy, while pea seeds are hard, round, and smooth. Have the student compare the shape of a seed such as marigold to other seeds used.

As seedlings emerge, invite the student to examine them closely, noting similarities and differences as the first leaves appear.

Larger seeds may be counted as they are planted, so that students will later be able to determine the percent germination of their seeds.

It is advisable to label each student's tray with his name. Braille label makers are available and are very convenient for this purpose. Each student should be made responsible for keeping his tray of seeds watered.



### Lesson Plan 3: Asexual Propagation

#### Goals:

1. To familiarize the student with some plants which can be propagated asexually by herbaceous stem or leaf cuttings.
2. To instruct the student in the proper techniques of asexual propagation.

#### Background:

Plants which are difficult to grow from seed may be cultivated more successfully from stem or leaf cuttings. This method produces a larger plant in a shorter period of time.

#### Materials:

1. Stock plants from which cuttings are to be taken -- some suitable plants include Coleus, Peperomia, Plectranthus australis - Swedish ivy, Alternanthera spp. - Joseph's coat, and Kalanchoe pinnata - Airplant. There are many others which may also be used.
2. Flats, trays, or other suitable containers.
3. Snips or scissors -- each student should be supplied with a pair.
4. A small stick the width of the flat or tray.
5. Media -- pure sand, vermiculite, or perlite is most desirable. Cuttings from some plants may root satisfactorily in the standard soil mix or a commercial potting mix.

Method:

The student should first prepare the flat or tray, filling it with the desired media which has been moistened. Stem cuttings should be made 2 to 4 inches long by snipping the stem just below a node. (The node is a knot or joint in the stem where the leaves are attached.) Remove the lower leaves and if the remaining leaves are very large, it is also good to trim them.

Working from left to right, stick the cuttings into the media near the edge of the flat, placing them fairly close together. A stick the width of the flat may be placed after each successive row to help keep the next row straight. Place the tray where it will receive moderate light and keep the soil moist.

For best results, a mist system is desirable. If such facilities are not available and the media is likely to become dry, the use of 'windowsill greenhouses' would be a very effective method of rooting cuttings. This involves the use of gallon size plastic bags into which is placed 3 inches of moist soil and approximately 6 cuttings. It is then closed and placed where it will receive indirect light. The plastic bag helps to retain moisture, lessening the need for constant attention. Label the individual flats with the names of the students.

Begin checking the cuttings after about 2 weeks. A gentle tug will tell you if it has rooted. When they have a fairly substantial root system, they may be transplanted into small pots.

Many common shrubs, such as hollies, azaleas, and forsythias, may also be propagated by softwood cuttings. The same procedure is followed, taking cuttings from the tips of immature shoots. These will require a longer rooting period, usually about 6 weeks.

Leaf cuttings are made by snipping the leaf off where it is attached to the stem. These are placed in the media up to the base of the leaf. It is advisable to start with a plant which is easy to root such as a *Peperomia*. Single leaves of the Kalanchoe can be secured flat on the surface of sand or vermiculite and young plantlets will form in the notches of the leaf.

#### Comments:

Often the success of a project is directly correlated with the students' continuing interest in that activity. Asexual propagation is one activity which will tax the patience of some students, therefore introduce propagation by rooting plants with a high degree of probable success. Following this initial gratification, it becomes a challenge to the student to root more difficult plants.

Stress the fact that the rooting medium must be kept moist in order for the plants to form roots. Again, make each student responsible for his own work.

If an adequate source of light is not available indoors, one effective alternative might be a propagation box. This is a box constructed of fiberglass on a wooden frame which may be filled with cuttings in a rooting medium and placed outdoors.

Suggested reference for Media and Propagation Activities: Hartmann, H. T. and D. E. Kester. 1968. *Plant Propagation: Principles and Practices*. Prentice-Hall, Englewood Cliffs, N. J.



### Lesson Plan 4: Transplanting

#### Goals:

1. To introduce the student to transplanting and the materials used.
2. To instruct the student in the proper techniques involved in transplanting rooted cuttings and seedlings.

#### Materials:

1. Rooted material to be transplanted -- this may include seedlings as well as rooted herbaceous and softwood stem cuttings.
2. Pots -- peat pots are very desirable for this purpose. Small plastic or clay pots or other small containers may be used. The most important requirement of any container is good drainage.
3. Media -- both the standard mix and commercial mixes are satisfactory. For transplanting cacti or other succulents, use the succulent mix.
4. Trowels -- these should be available for the student's use in filling containers and mixing soil.
5. Watering container -- a watering can or empty dish detergent bottle is suitable.

#### Method:

When the seedlings are large enough to handle without excess damage, they should be potted in small pots. Fill the pot with soil to within about 1 inch of the top. The finger may be used to make a small hole in the soil. In removing the seedlings from the rooting medium, dig under the plants with the fingers, gently lifting a small bundle while holding the roots and soil firmly. Place the seedlings

on moist paper to prevent drying. Carefully separating the plants, put one seedling in the pot, pushing the soil around the stem and roots.

Remove rooted herbaceous or softwood cuttings in the same manner, taking care not to disturb the root system any more than necessary. Place the individual cuttings in a pot half filled with soil. Finish filling the pot to within 1 inch of the top, pressing the soil around the roots and stem for support.

Plants should then be watered thoroughly to help the soil settle around the roots. Water seedlings carefully to prevent washing the soil away from the plant with subsequent uprooting of the plant. Be sure it is placed in a location where it will receive adequate light.

#### Comments:

It is again suggested that each student's work be labeled. It may be convenient to group individual student's pots in trays or flats.

As the plants grow and their root systems become more developed, they should be repotted into progressively larger containers.

Softwood cuttings with a substantial size and root system may be transplanted outdoors. Those in peat pots may be planted directly in the ground with the peat pot. It is best to tear the pot open in several places, covering it completely when in the ground.

If space is available, the students may wish to begin a spring or fall vegetable garden with vegetable seedlings which they have grown. References may be obtained which provide information on suggested plants, planting dates, fertilization requirements, etc., for specific locations.

## Lesson Plan 5: Terrarium Construction

### Goals:

1. To introduce the student to terrariums and their history.
2. To familiarize the student with the plants and materials used in making terrariums.

### Background:

Originally called 'Wardian Cases', named after the English botanist, Dr. Nathaniel Ward, terrariums served as protective containers for plants being shipped across oceans. Though sometimes thought of as merely decorations, they can actually be complete gardens in a single miniature container, with the individual creating the effect he desires.

### Materials:

1. Container -- these can range from small jars to very large aquariums. It is advisable to use a large-mouthed container for ease of planting and arranging plants in the desired locations. Whether glass or plastic, for best results use a container that is clear, not tinted.
2. Soil -- either the standard mix or a commercial mix is suitable. The soil should be sterilized.
3. Gravel -- small pea size gravel is preferred.
4. Charcoal -- regular charcoal briquettes which have been crushed are satisfactory. A one gallon container will require about one briquette.
5. Plant material -- Almost any naturally small or slow growing plant can be used. Suggested plants include Ficus pumila - Creeping fig, Iresine herbstii -



Bloodleaf, Maranta leuconeura - Prayer plant, Pilea nummulariaefolia -

Creeping Charlie, and Saxifraga sarmentosa - Strawberry Begonia. Moss, small ferns, and selaginella are also excellent choices. Plants may be obtained from garden centers, variety stores, or they may be collected. Whether creating a moist shaded or a dry sunny environment, choose plants which will thrive in the given conditions.

6. Watering container -- a small sprinkler bottle or a paper or styrofoam cup with pin holes in the bottom can be used.
7. Sand, small figurines, or a water feature may be added as decorative accents or to help create the desired landscape effect.

#### Method:

Begin with a clean, dry container. Place about one inch of gravel in the container to provide drainage. Next, sprinkle the crushed charcoal over the gravel. This is added to help keep the growing medium fresh and conducive to good growth. Add soil to a depth of approximately  $\frac{1}{4}$  the height of the container. (This may be estimated by using a wire the height of the container. Bend it first in half and cut it; then repeat this with one of the remaining pieces. You now have a guide which can aid in measuring soil depth when held upright on the bottom of the container.) It is helpful to moisten the soil before it is added.

If plants are in peat pots, remove the pot by tearing it away from the soil. Remove as much of the soil as possible. If root systems are very large, it may be necessary to trim them in order to fit the plant in the terrarium. Place the plants in the soil, covering the roots and gently firming the soil around them.

The terrarium may be landscaped by placing the tallest plants near the back with smaller ones in front, or the tallest specimen in the center surrounded by smaller ones for a circular arrangement. The student may wish to mound the soil creating hills and valleys.

Water the terrarium until the soil feels moist but not soggy. Check the soil every 2 to 4 weeks. It should be damp to the touch. If the soil seems too wet, remove the cover if possible to allow it to dry out some. The terrarium should be placed in bright indirect light but not in direct sunlight.

#### Comments:

Although some supervision may be needed, let each student do his own work. This is an excellent activity for the expression of individual creativity.

Stress the fact that it is very easy to overwater a terrarium. Because of their closed environment, they need much less water than houseplants.

As the plants grow, some may become too large for the container. The height of these plants may be reduced or controlled by pinching off the top growth, or by replacing them with smaller plants.

Suggested reference: Arthurs, K. (ed.). 1975. Sunset Book: Terrariums and Miniature Gardens. Lane Magazine and Book Co., Menlo Park, CA.

## Lesson Plan 6: Cactus Dish Gardens

### Goals:

1. To introduce the student to cactus dish gardens.
2. To instruct the student in the proper procedure for making a cactus dish garden.

### Background:

Cacti and other succulents have the characteristic of storing moisture in their fleshy stems and leaves. They are popular for use in containers because most are able to thrive in the normally dry, warm atmosphere of the average home.

### Materials:

1. Container -- any shallow dish such as a large butter tub, cereal bowl, etc.
2. Gravel.
3. Media -- the succulent mix of 1 part peat, 1 part soil, and 2 parts sand is excellent for this.
4. Plants -- almost any species of cacti or succulents. The student may wish to use the cactus seedlings they started earlier. Suitable plants include some species of Echeveria, Agave, Euphorbia, Rebutia, and Crassula.
5. Trowels.
6. Sand -- can be used for decoration or accent, to give a desert appearance.
7. Small figurines or colored gravel for accent. (Optional)



Method:

Place a layer of gravel in the bottom of the container. Fill with soil mix. A small hole for each plant may be dug with the finger. Carefully place each plant in the desired location and firm the soil around the roots. With some spiny cacti, gloves may be needed. Arrange the plants so that there is space between them allowing for growth. Sand may be sprinkled over the surface and left flat or mounded for interest. Small animal figurines, rocks, etc., may be added. Water the garden until the soil is moist and place it where it will receive plenty of indirect light.

Comments:

Because some cacti have very sharp spines, it is suggested that gloves be worn if the student can still manipulate the plants this way and is not excessively hindered by gloves. Otherwise, use discrimination in selecting plants for this activity. The students in this study, however, did not object to the spines, as they made it more interesting and more of a challenge to them.

Take care not to allow the soil to become too dry. As a rule of thumb, water the garden thoroughly, then allow the soil to become dry and let it remain dry for 2 to 3 days before rewatering.

Suggested reference: Edinger, P. (ed.). 1975. Sunset Book: Succulents and Cactus. Lane Magazine and Book Co., Menlo Park, CA.

## Lesson Plan 7: Drying Flowers

### Goals:

1. To introduce the student to the principles of preserving plant material by drying.
2. To familiarize the student with some flowers which are easily dried.
3. To instruct the student in the techniques involved in drying flowers in sand and by hanging the materials.

### Background:

There are several methods of preserving plant materials, including drying, pressing, and the use of glycerin. Drying is the easiest method, therefore this discussion will be limited to that procedure. The sources of materials for drying are virtually endless.

### Materials:

1. Sand -- clean white sand. It must be thoroughly dried before it is used.
  2. Container with lid -- a shoebox or similar cardboard box is ideal.
  3. Wire -- No. 23 or 24 wire may be used or wire about the size of a heavy pin.
  4. Strings -- used for hanging materials to be air-dried.
  5. Storage container -- any airtight container would be suitable.
  6. Semi-gloss wood finish -- may be used to help preserve the flowers longer.
  7. Plant materials to be dried -- for drying in sand, suggested flowers include rosebuds, anemones, daffodils, dwarf marigolds, small dahlias, and zinnias.
- Flowers suitable for air-drying include marigolds, celosia, salvia, baby's breath, goldenrod, and strawflowers.

Method:

To air-dry flowers, simply hang small bunches upside down, preferably not touching, in a dark, dry, and airy place. If dried in the light, much of their natural colors will be lost. They should be dry in about a week.

Strawflowers may be dried easily by snipping the flowers from the stem and inserting a wire up through the center of the bloom. This is done because the flower's own stem will not support it when dry. The wired flowers may then be stuck upright in blocks of styrofoam to dry.

To prepare flowers for sand drying, cut the stem at the base of the bloom and insert a 6" piece of wire where the stem was cut. It may be helpful to hold the flower in the hand, placing the index finger over the center of the flower while inserting the wire. This will be more difficult with some flowers than with others. Cover the bottom of the container with a layer of newspaper. Place about 1" of sand on this. Lay each wired flower flat on the sand. Holding the flower, gently sift the sand over it until it is completely covered. The student may find it easier to keep his place by inserting a marker (such as a wooden plant label) after each flower, taking care not to let the flowers touch. Continue the procedure until the box is full. Cover and label the box, placing it in an undisturbed location for about 6 days.

When removing flowers from sand, carefully locate the wire and lift it slowly toward the flower. Tap the wire gently to remove any sand clinging to the flower. Stick the wires into a styrofoam block (a pot of soil or sand will serve the same purpose). They may now be sprayed lightly with a semi-gloss finish. When dry, store in an airtight container until ready for use.



Comments:

Emphasize to the student that care and patience must be taken in removing flowers from sand as the petals are very fragile and delicate.

When drying flowers that are trumpet-shaped, such as daffodils, it is suggested that the bloom be carefully filled with sand to help preserve the natural shape.

Flowers may be dried in sand without wiring them first, but it was found that the students had great difficulty inserting the wire into the dried, brittle blooms.

When cutting flowers to be dried, avoid cutting them early in the morning when they are still covered with dew or immediately after watering.

## Lesson Plan 8: Dried Flower Arrangements

### Goals:

1. To introduce the student to the basic principles of flower arrangement.
2. To give the student the opportunity to be creative.

### Background:

In preparing dried flower arrangements, essentially the same principles are followed as for fresh flowers. Dried arrangements are especially popular as decoration in the home or other situations where a more permanent display is desired.

### Materials:

1. Container -- small, shallow containers may be obtained from a florist supply company. Small butter tubs, baskets, etc., may also be used.
2. Styrofoam or oasis -- this may be secured in the container as a medium to support the flower stems.
3. Dried moss -- used to conceal the styrofoam.
4. Dried materials -- materials which the students dried may be used. Material may also be purchased from floral supply companies or many garden shops.
5. Pipe cleaners -- (optional) these make it possible to add length to stems.
6. Snips.
7. Clear spray varnish -- to further preserve and protect the flowers.

Method:

Secure a piece of styrofoam in the container, covering it with a thin layer of moss. A simple arrangement which can be attempted is a small circular arrangement which can be viewed from all sides. Such an arrangement would be suitable as a centerpiece.

Begin in the center, placing the tallest and smallest flowers here. These flowers should face upward. Working down from each side, fill in around this center grouping. Continue until reaching the edge of the container, overlapping it slightly. The largest flowers should be here around the base. As flowers are placed closer to the base, they should begin to face out. Take care not to cut the stems too short, as you do not want the flowers spaced so that they are too close and compact. As a general rule, the flowers should be no more than about 1 and  $\frac{1}{2}$  times the height of the container itself. Spray the finished arrangement with a clear spray finish.

Comments:

Supervision and assistance are necessary with this activity. It was found that the students with some vision accomplished this task satisfactorily. Those students who are totally unsighted become impatient and frustrated. It is therefore suggested that this activity be generally limited to use with students who have some vision.

Perhaps a more successful activity might involve arranging a few small flowers in a mini-bottle, medicine bottle, etc., which has been filled with sand to support the stems.



### Lesson Plan 9: Potpourri

#### Goals:

1. To introduce the student to an unusual activity which can be carried out with easily obtainable materials.
2. To stimulate the student's sense of smell, emphasizing the importance of this sense in identifying materials.

#### Materials:

1. 1-gallon dried flower petals -- almost any type of flower can be used.
2. A container for mixing -- any 2-gallon container is suitable.
3. 1 box plain salt.
4. 1 tablespoon allspice.
5. 1 ounce Oil of Bergamot.
6.  $\frac{1}{2}$  ounce orris root powder.
7. 1 small box ground cinnamon.
8. 1 box bay leaves
9. wide mouth gallon jars for storing the mixture.

#### Method:

To prepare the flower petals, remove the petals from flowers and spread thinly on a newspaper in a box. Leave the box uncovered. Stir once a day until dry - about 1 week.

Into a large container place the dried petals, adding the remaining ingredients and mixing thoroughly. Pack the potpourri in a wide mouth gallon jar or similar container. Cover tightly and store for 6 weeks.

The mixture may then be taken out and put in small jars or small cloth bags. The jars may be opened for a few hours to scent the room and the sachet bags can be hung in closets.

Comments:

This simple activity was also one of the most popular ones. The main reason given by students is the aroma of the different ingredients and the mixture. They enjoy identifying each ingredient by its aroma.

In this activity, materials usually found in the home or the kitchen are combined with a horticultural material yielding a very desirable product.

## Lesson Plan 10: Hanging Baskets

### Goals:

1. To introduce the different types and uses of hanging baskets to the student.
2. To instruct the student in the proper procedures for making a hanging basket.

### Background:

A hanging basket is a lovely way of displaying a plant with a graceful pendulous growth habit. They are especially useful where windowsill space is limited.

Plants suitable for basket culture range from shrubs such as azaleas, and house-plants such as fushias, begonias, and spider plants, to vegetables including cherry tomatoes and cucumbers.

### Materials:

1. Container -- these may be pottery, wooden, wire, or plastic. As a recycled container, a potato chip can may be used with holes in the sides displaying plants held in place with moss.
2. Sphagnum moss or liners -- (optional) for use with wire baskets.
3. Gravel.
4. Media -- a standard mix or a commercially prepared mix.
5. Plants -- some plants which are very successful in hanging baskets include Wandering jew, Swedish ivy, certain basket begonias, and Airplane or Spider plants. Students may use plants which they have rooted.



Method:

Place gravel in the bottom of the desired container for drainage. (Wooden containers may be lined with foil or plastic, and a fiber liner or moss may be used to line a wire basket.) Fill the basket with soil mix to within 1 inch of the top. A hole may be dug with the finger for each plant. The plants are then placed in the holes and soil is firmed around the stem and roots. It is suggested that about 6 plants be used for an 8 to 10 inch container. The number may vary, depending on plant size and growth rate.

Water the basket until the soil is thoroughly moist. Place it where it will receive an adequate amount of light.

Comments:

This is an excellent activity for the unsighted, where they can make use of plants they have rooted earlier. The results are more immediate than with some activities.

Half containers are available which will lie flat against a wall, fence, or other background.

Students may enjoy experimenting with vegetables such as cherry tomatoes. Vegetable culture in hanging baskets is particularly useful when space is not available for an outdoor garden. Being able to harvest and consume something they have grown can be very rewarding to the student.

Suggested reference: Osborne, R. (ed.). 1975. Sunset Ideas for Hanging Baskets. Lane Magazine and Book Co., Menlo Park, CA.

## APPENDIX D: A DESCRIPTIVE GUIDE TO THE IDENTIFICATION OF COMMON HOUSEPLANTS

### List of Plants Found in Descriptive Guide

- |  |                            |
|--|----------------------------|
| 1. <u>Adiantum cuneatum</u>                    | Maidenhair fern            |
| 2. <u>Aechmea spp.</u>                         | Bromeliad                  |
| 3. <u>Aeschynanthus javanicus</u>              | Lipstick plant             |
| 4. <u>Aglaonema simplex</u>                    | Chinese evergreen          |
| 5. <u>Aloe vera</u>                            | Medicine plant, True Aloe  |
| 6. <u>Alternanthera bettzickiana</u>           | Joseph's coat              |
| 7. <u>Aphelandra squarrosa</u>                 | Zebra plant                |
| 8. <u>Araucaria excelsa</u>                    | Norfolk Island Pine        |
| 9. <u>Asparagus plumosus</u>                   | Asparagus fern             |
| 10. <u>Begonia argenteo - guttata</u>          | Angel - wing begonia       |
| 11. <u>Begonia semperflorens</u>               | Wax begonia                |
| 12. <u>Brassaia actinophylla</u>               | Schefflera, Umbrella tree  |
| 13. <u>Chamaedorea elegans</u>                 | Parlor palm                |
| 14. <u>Chlorophytum comosum</u>                | Airplane plant             |
| 15. <u>Chrysanthemum morifolium</u>            | Chrysanthemum, Mum         |
| 16. <u>Coleus blumei</u>                       | Coleus                     |
| 17. <u>Crassula argentea</u>                   | Jade plant                 |
| 18. <u>Cyrtomium falcatum</u>                  | Holly fern                 |
| 19. <u>Davallia bullata</u>                    | Squirrel - foot fern       |
| 20. <u>Dieffenbachia picta</u>                 | Dumbcane                   |
| 21. <u>Dizygotheca elegantissima</u>           | False aralia               |
| 22. <u>Dracaena marginata</u>                  | Red-edge dracaena          |
| 23. <u>Dracaena sanderiana</u>                 | Ribbon plant               |
| 24. <u>Episcia reptans</u>                     | Episcia, Peacock plant     |
| 25. <u>Euphorbia pulcherrima</u>               | Poinsettia                 |
| 26. <u>Ficus pumila</u>                        | Creeping fig               |
| 27. <u>Gynura aurantiaca</u>                   | Velvet plant               |
| 28. <u>Hedera helix</u>                        | English ivy                |
| 29. <u>Hypoestes sanguinolenta</u>             | Pink polka-dot plant       |
|  | Freckle-face               |
| 30. <u>Impatiens sultanii</u>                  | Sultana, Patient Lucy      |
| 31. <u>Iresine herbstii</u>                    | Bloodleaf                  |
| 32. <u>Kalanchoe pinnata</u>                   | Airplant                   |
| 33. <u>Kalanchoe tomentosa</u>                 | Panda plant                |
| 34. <u>Kalanchoe tubiflora</u>                 | Kalanchoe, Air plant       |
| 35. <u>Maranta leuconeura 'Kerchoveana'</u>    | Prayer plant               |
| 36. <u>Monstera deliciosa</u>                  | Split-leaf philodendron    |
| 37. <u>Oxalis violacea</u>                     | Oxalis, Violet wood sorrel |
| 38. <u>Pelargonium hortorum</u>                | Geranium                   |
| 39. <u>Pellionia pulchra</u>                   | Pellionia                  |
| 40. <u>Peperomia caperata 'Emerald Ripple'</u> | Emerald ripple peperomia   |

- |   |                               |
|---|-------------------------------|
| 41. <u>Peperomia obtusifolia</u>                  | Pepper-face peperomia         |
| 42. <u>Philodendron micans</u>                    | Velvet-leaf philodendron      |
| 43. <u>Philodendron oxycardium</u>                | Heartleaf philodendron        |
| 44. <u>Pilea cadierei</u>                         | Aluminum plant                |
| 45. <u>Pilea nummulariaefolia</u>                 | Creeping Charlie              |
| 46. <u>Platycerium bifurcatum</u>                 | Staghorn fern                 |
| 47. <u>Plectranthus australis</u>                 | Swedish ivy                   |
| 48. <u>Rosa hybrida</u>                           | Rose                          |
| 49. <u>Saintpaulia ionantha</u>                   | African violet                |
| 50. <u>Sansevieria trifasciata</u>                | Snake plant                   |
| 51. <u>Sansevieria trifasciata</u> 'Hahnii'       | Bird's nest sansevieria       |
| 52. <u>Saxifraga sarmentosa</u>                   | Strawberry Geranium           |
|   | Strawberry Begonia            |
| 53. <u>Schlumbergera bridgesii</u>                | Christmas cactus              |
| 54. <u>Sinningia speciosa</u>                     | Gloxinia                      |
| 55. <u>Spathiphyllum commutatum</u> 'Clevelandii' | Spathiphyllum, Peace Lily     |
| 56. <u>Syngonium podophyllum</u>                  | Nephthytis, African evergreen |
|   | Arrowhead plant               |
| 57. <u>Zebrina pendula</u>                        | Wandering jew                 |



## Glossary of Technical Terms Used in Descriptive Guide

1. acute - sharply pointed; usually applies to apex
2. adventitious - buds or roots that develop in other than the usual places
3. alternate - arranged along a stem at different levels
4. apex - the tip of an organ (as a leaf)
5. axil - the angle where the leaf rises from the stem
6. blade - the expanded portion of a leaf
7. bract - modified or reduced leaves; usually colored
8. bulb - a short underground stem surrounded by fleshy leaves or scales
9. compound - composed of 2 or more similar and united parts (as a leaf with 2 or more leaflets)
10. convex - umbrella like
11. entire - margin without teeth, lobes, or divisions
12. epiphyte - airplant; a plant growing on another but not taking food from its host
13. fertile - spore bearing or seed bearing
14. frond - leaf of a fern
15. leaflet - a single unit or division of a compound leaf
16. lobe - a usually rounded segment of a leaf
17. margin - the outer portion or edge of a leaf
18. midrib - the central or main rib or vein of a leaf
19. node - a joint on a stem where leaves are born
20. oblong - much longer than broad with parallel sides
21. opposite - opposite each other in position (as opposite leaves)
22. palmate - lobed or divided in hand or palm like fashion
23. parallel - equally distant at every part
24. pedicel - stalk of each flower in a cluster
25. peduncle - stalk of a flower cluster
26. pendulous - drooping, hanging downward
27. petal - a flower leaf
28. petiole - leaf stalk
29. petiolule - leaflet stalk
30. pinnae - leaflet of a pinnate leaf
31. pinnate - leaflets arranged along side of leaf stalk, separation complete
32. reflexed - curved downward or backward
33. runner - a slender shoot, rooting at the end or at joints
34. sepal - leaflike structures below the petals of a flower
35. serrate - notched like a saw; finely toothed
36. simple - a leaf that is not compound
37. spike - elongated flower stem, with flowers not stalked
38. spore - an asexual reproductive cell
39. stipe - the petiole of a fern leaf
40. succulent - juicy, fleshy, or storing water in stems or leaves
41. tuber - fleshy enlarged portion of a rhizome or stolon
42. vein - strands of fibrovascular tissue in a leaf; may be very noticeable
43. whorled - leaves in a circle around stem at one node

## Descriptive Guide

### 1. Adiantum cuneatum - Maidenhair fern

leaf: compound, each frond coming singly from the ground

leaflet: on stalks arranged alternately on the stipe

each leaflet is alternate, delicate, and lacy

triangular, with wedge shaped base; like an open fan

slight indentations or scalloped along the apex

stem: very small, thin, and wiry; brittle

Propagated by cutting back and dividing the roots

### 2. Aechmea spp. - Bromeliad

leaf: leaves in vase form like a funnel; a rosette

dry, smooth texture; tough and leathery

some species have sharp spines along the leaf margin

flower: may be on a spike or hidden down in center of vase

a panicle of berries or feathery, brushlike mass of blooms

Gets moisture from the water it holds in its cup-like base

Propagated from new shoots appearing at base of old plant

### 3. Aeschynanthus javanicus - Lipstick plant

leaf: simple, opposite, entire; pointed oval shape

midrib prominent on underside

thick, smooth, with somewhat sticky feel

petiole: very short

stem: each comes singly from the ground

slightly fuzzy; drooping habit

flower: long lipstick-like tubes surround the 2" flowers

soft; only open and spread at the tip

Propagated by stem cuttings

4. Aglaonema simplex - Chinese evergreen

leaf: simple, entire; narrow oblong or lance shaped

grows with a slight twist, tapering to a long thin tip

thin, papery; glossy with depressed veins

stem: round, cane-like

flower: the flower is on a smooth, round spike, but is not as

conspicuous as the berries which follow it

Propagated by stem cuttings, from sections of main stem, and  
by air layering

5. Aloe vera - Medicine plant, True Aloe

leaf: simple, entire; upright growth

very thick, fleshy, succulent; edged with spines

upper surface flat, underside is more rounded

dagger shaped, pointed

grow 2-ranked like a bird's tail feathers opening

when mature, some species begin rosette pattern of growth

stem: very short; almost stemless

Juice of the leaves is said to be a soothing ointment for burns and cuts.



Propagated from young shoots or suckers appearing at base of larger plant.

6. Alternanthera bettzickiana - Joseph's coat

leaf: simple, opposite, entire

long, thin, pointed oval

leaves sometimes curl or roll from sides

forms a bushy plant

petiole: smooth; as long as the leaf blade

stem: small, round, with close and prominent nodes

feels rough because of the nodes

flower: small and inconspicuous

found in the axil of the petiole and the stem

Small plant, usually only 1', whose colors change, giving it the name Joseph's coat of many colors. Propagated by stem cuttings.

7. Aphelandra squarrosa - Zebra plant

leaf: simple, opposite, entire; oblong with a pointed tip

soft, wet, leathery

midrib and veins prominent on underside

petiole: short, smooth

stem: rough, especially on older tissue

gets harder, more woody on older tissue

flower: waxy blooms on a four sided terminal spike

Propagated by stem cuttings. Plant is green, striped with white on the midrib and main veins.

8. Araucaria excelsa - Norfolk Island Pine

leaf: short needles, very dense or thick on branches

opposite, soft

stem: rough, hard, with sharp prickly spines or needles

branches parallel to ground in tiers with several branches

whorled at one level around the stem

Slow growing in pyramidal form. Can get quite large.

Propagated by seeds. A cutting can be taken from tip of tree,

but its shape will be ruined.

9. Asparagus plumosus - Asparagus fern

leaf: fronds arising singly from the ground

needles soft, flat, not prickly

similar to a bottle brush; soft and fluffy

stem: covered thickly with needles

drooping or arching habit

flowers: tiny and inconspicuous along the branches

slightly fragrant

berries: found along the stem following the flowers

Propagation by root division

10. Begonia argenteo-guttata - Angel-wing begonia

leaf: simple, alternate, smooth

slightly lobed or serrated with pointed tip

shaped like an angel wing

thin, leathery, waxy; veins prominent on underside

stem: thick, hard, smooth

flowers: pendant

Propagated by stem or leaf cuttings

11. Begonia semperflorens - Wax begonia

leaf: simple, opposite; smooth on both sides

fleshy; margin rough or toothed as if raveled

oval heartshaped with one side smaller than the other

petiole: very short, smooth, round

stem: thick, smooth, round

flower: convexed with two small petals opposite each other and

two larger ones opposite

satiny smooth, on a long stipe

This fibrous rooted begonia is a highly variable species.

Propagated by stem cuttings

12. Brassaia actinophylla - Schefflera, Umbrella tree

leaf: compound, alternate

leaflet: soft, smooth, leathery; entire

oblong, up to 12"; midrib very prominent



arranged spirally or whorled in an open circle

on young plants - 3 to 5 leaflets; on older plants - up to 16

petiolule: smooth, short, about 3"

petiole: very long, smooth

stem: thick, hard, woody type stem

round with large prominent nodes

Can get extremely large in natural habitat.

Propagated by seed.

### 13. Chamaedorea elegans - Parlor palm

leaf: compound, arching; may have spines at base of frond

leaflet: opposite, entire; very long and narrow

top - smooth; midrib on underside is very scratchy

stem: rough, reed-like; feels like it's covered with straw at base

When small, some dwarf species may be used in terrariums.

Propagated by seed.

### 14. Chlorophytum comosum - Airplane plant

leaf: simple, entire; arching

long, narrow, smooth like broad blades of grass

spreading from a central point like the legs of a daddy-long-legs

stem: small, round, smooth; emerges from center of plant

may have blooms or small plantlets forming along the runner

or at the tip

flower: small, about 1"; star-shaped

may form about every 3" on shoot

plantlets: tufts of leaves with aerial roots

Propagated by plantlets or root division. Solid green color.

Note: The spider plant is very similar to the airplane plant but has green leaves with a white stripe down the center.

15. Chrysanthemum morifolium - Chrysanthemum, Mum

leaf: simple, alternate, entire to deeply lobed on older leaves

midrib and veins prominent on underside

top is soft, slick, and fuzzy

underside is soft and fuzzy

leaves are strongly scented

petiole: short, smooth

stem: round, smooth but fuzzy

bud: smooth, fairly hard, round; arises in leaf axils

flower: many colors and types

outer petals(ray) - long, smooth and narrow

inner petals(disk) - shorter than outer petals but similar

Propagated by stem cuttings.

16. Coleus blumei - Coleus

leaf: simple, opposite; margin regularly scalloped

soft, velvety; surface smooth and ripply

heartshaped to pointed oval

petiole: short, smooth, square

stem: smooth, square; fairly hard, almost succulent

flower: delicate, small; opposite to whorled on a terminal spike

Propagated by stem cuttings or seed. Miniature varieties are available.

17. Crassula argentea - Jade plant

leaf: simple, opposite, entire; small and smooth

very thick and rubbery; round to broad oval shaped

upper surface rounded, lower surface flat

stem: hard, very thick; forking type growth habit

smooth when young; older tissue is more woody

Often takes the form of a miniature tree. Propagated by stem or leaf cuttings.

18. Cyrtomium falcatum - Holly fern

leaf: compound, fronds arise singly from the ground

sometimes appear twisted

leaflet: alternate; long ovate, more rounded at base

serrated, 3 to 5 pointed with pointed tip

thick, fairly leathery, slick

midrib prominent on underside

leaflets tend to curl; may have spores on underside of leaf

stem: smooth on new growth; scaly at base on older stems

round, hard



Propagated by spores or root division. Durable under adverse conditions.

Note: As in many ferns, new fronds unroll from fiddleheads, so named because they resemble the curled head of a fiddle.

19. Davallia bullata - Squirrel-foot fern

leaf: a compound frond; soft, delicate

may be 1 to 2 feet long; pyramidal or triangular shaped

leaflet: smooth, delicate, entire; finely cut

stem: smooth, thin

round except for a boat-shaped groove along the side

Creeping stems or rhizomes along the soil at the base of the plant are wooly like a squirrel's foot. Propagated by dividing rhizomes and pinning to soil to root, or from spores.

20. Dieffenbachia picta - Dumbcane

leaf: simple, alternate, entire

new leaves emerge from top and unroll

soft, flexible, leathery; large, oblong with pointed tip

midrib prominent on bottom

petiole: smooth, large or thick

boat-shaped especially where it joins stem

stem: scaly and rough with rings up the stem where older

lower leaves have come off

usually single stem

Called Dumbcane because the sap is said to cause the tongue and throat to swell so that speech is impossible. Propagated from sections of the stem or by air layering.

21. Dizygotheca elegantissima - False Aralia

leaf: compound, alternately arranged

composed of 7 to 10 leaflets whorled at the tip of the petiole

leaflet: narrow, ribbon-like; leathery, smooth

jagged with notched edges, saw-toothed

petiole: very long, smooth, and round

stem: upright, thin, rough, and hard

May form a small tree up to 25'. Propagated by stem cuttings.

22. Dracaena marginata - Red-edge dracaena

leaf: simple, entire; very narrow, dagger-like

spiraled atop the stem in a dense terminal rosette

leathery, thickened, stiff

upright growth; lower leaves may droop or hang down

stem: thick, round, scaly

trunk may zig-zag and curve

Propagated by stem cuttings, sections of the main stem, or

air layering.

23. Dracaena sanderiana - Ribbon plant

leaf: simple, entire; oblong 8 to 12", tapering to a point

base wraps around stem, spiraling upright in a rosette

spear shaped, sometimes twisted; prominent midrib

leathery, smooth

stem: smooth, very short; slender and canelike

Resembles a corn plant. Propagated by stem cuttings, sections of the main stem, or by air layering.

24. Episcia reptans - Episcia, Peacock plant

leaf: simple, opposite, entire

of medium size, 1 - 4"

downy or fuzzy like felt; midrib sunken on top

slightly convexed, oval with a dull pointed tip

all veins prominent on underside

petiole: short and fuzzy

stem: hard, fuzzy

sends out runners like a strawberry plant with small

plantlets at the tip

flower: tubular, soft

Good for hanging baskets. Propagated from runners or stem cuttings.

25. Euphorbia pulcherrima - Poinsettia

leaf: simple, alternate; margin smooth with 5 distinct points

broad oval; veins and midrib prominent on underside

stem: smooth, slick, with prominent nodes

rough, woody at base



bracts: modified leaves, oval with pointed tip

slick, smooth, waxy; on long petioles

whorled; midrib and veins prominent below

flower: the true flowers are tiny nubs in the center of the bracts

Has an unpleasant milky sap, often poisonous. Propagated by stem cuttings.

26. Ficus pumila - Creeping fig

leaf: simple, alternate, entire; very small

round to heart shaped, often with one side of leaf longer

dull texture, not very smooth

petiole: very short, not noticeable

stem: rough, small; nodes closely spaced

With a vining type growth, it can cling to walls by roots along the stem. Used in terrariums and for hanging baskets. Propagated by stem cuttings.

27. Gynura aurantiaca - Velvet plant

leaf: simple, alternate, unevenly serrated with jagged margin

irregular shape, long; veins prominent on surface

very soft and wooly, especially on younger leaves

older leaves have more hairs along veins and margins

petiole: short, hairy

stem: rough, hairy, not round

flower: in a terminal cluster

tubular, fairly hard

unpleasant odor like a ripe Chinaberry

Straggly growth habit. Propagated by stem cuttings.

28. Hedera helix - English ivy

leaf: simple, alternate, 3 to 5 lobed

heart shaped with jagged tips; smooth

medium thickness, slightly leathery

slick underneath with midrib prominent on underside

petiole: smooth, round; long in comparison to leaf

stem: smooth; rough on older tissue; round

may find roots along stem

Vining growth habit, clinging to upright surfaces.

Propagated by stem cuttings.

29. Hypoestes sanguinolenta - Pink Polka-dot plant, Freckle-face

leaf: simple, opposite, entire; soft, smooth

small, long oval, about 2"

set densely on stem

can faintly detect midrib and veins on underside

petiole: small, soft, round, short

stem: hard, thin; fuzzy or hairy

Propagated by stem cuttings.

30. Impatiens sultanii - Sultana, Patient Lucy

leaf: simple, whorled in clusters

smooth, dull but waxy with tiny soft spines along the margin

broad oval with pointed tip; prominent midrib

stem: smooth, hard; often bent, not straight

watery or succulent-like

flower: soft and smooth; at tip of stem above cluster of leaves

has 4 small petals and 1 large petal

whiplike appendage just under the blossom

Propagated by stem cuttings and by seed.

31. Iresine herbstii - Bloodleaf

leaf: simple, opposite, entire; small, about 1"

round with notched tip; smooth but slightly quilted

on larger leaves, midrib is prominent on underside

stem: round, smooth, somewhat flexible

usually many branching

Grown for the brilliant red of the leaves and stem.

Propagated by stem cuttings.

32. Kalanchoe pinnata - Air plant

leaf: simple, opposite; oval, smooth

thick, fleshy, succulent; convexed slightly

notched, almost scalloped

stem: hard, smooth, round



often single stemmed

flowers: clusters on spikes

small with 4 petals

Young plants are produced in the notches of the leaves.

Propagated by these young plantlets that are formed.

33. Kalanchoe tomentosa - Panda plant

leaf: simple, alternate, entire, but sometimes notched near tip

thick and succulent; oblong and tapered

very soft and fuzzy like thick felt

leaves attached directly to stem

stem: very short internodes

hard, almost round; soft and fuzzy texture

Often find roots growing along the stem. Propagated by stem or leaf cuttings.

34. Kalanchoe tubiflora - Kalanchoe, Air plant

leaf: simple, opposite, entire; small, almost cylindrical

thick and succulent

stick out horizontally from the stem

stem: slender, erect; usually a single stem

hard, smooth to slightly rough at base

Propagated from young plantlets which form at the tips of the leaves.

35. Maranta leuconeura 'Kerchoveana' - Prayer plant

leaf: simple, entire, alternate

round to oval, about 6" long

smooth, thin, and flat with prominent midrib and veins

many leaves and stems seem to emerge from a central

point at the base

stem: round, hard

irregular branching

Leaves fold upward in the evening like hands in prayer.

Propagated by root division.

36. Monstera deliciosa - Split-leaf philodendron

leaf: simple, alternate, very large

smallest leaves may be round and entire

largest leaves may be deeply lobed with 4 to 6 lobes on

each side

leaves may have actual holes in them

smooth, thick, with the texture of soft polished leather

midrib and veins very prominent on top and bottom

veins almost at right angle to the midrib

petiole: large, hard, long

round with boat shaped groove along the edge

dried straw-like tissue along this groove where the petiole

joins the stem

stem: hard, round, smooth

sounds hollow when tapped

has long cord-like roots along the stem

Can be trained to climb around a stake. Philodendron pertusum is thought to be the juvenile form of Monstera. Propagated by stem cuttings, sections of the main stem, or by air layering.

37. Oxalis violacea - Oxalis, Violet wood sorrel

leaf: compound, 3 lobed like clover

leaflet: entire, whorled in 3's at tip of petiole

small, soft, and smooth

round with indentation at apex

petiole: very long, smooth, thin, and round

emerges from the ground in clumps

flower: small, delicate, tubular, with 5 petals

A small plant only 4 to 6 inches in height.

Propagated from small bulbs that develop beside larger ones.

38. Pelargonium hortorum - Geranium

leaf: simple, alternate, with scalloped margin

soft, plush on both sides; wavy, fairly thick

horseshoe shaped; veins prominent on underside

stem: hard, thickened; soft and fuzzy texture

flower: very soft, smooth, slick petals



each bloom on a long pedicel, clustered at the end  
of a long fuzzy stalk

Leaves have a very distinct odor.

Propagated by stem cuttings.

39. Pellionia pulchra - Pellionia

leaf: simple, alternate; small, oval

smooth and leathery with jagged margins

petiole: smooth, very short

stem: smooth, a fleshy creeper

very short internodes, leaves densely set

Good for hanging baskets. Propagated by stem cuttings.

40. Peperomia caperata 'Emerald Ripple' - Emerald Ripple peperomia

leaf: simple, alternate, entire

small, roundish, heartshaped

tender, crisp, waxy

deeply quilted or corrugated like a washboard

petiole: smooth, slick; round and very long

stem: very short, smooth

A small plant, propagated by leaf or stem cuttings.

41. Peperomia obtusifolia - Pepper face peperomia

leaf: simple, alternate, entire but slightly notched at tip

smooth, slightly concave

midrib distinct, almost like a crease or fold

very thick, fleshy; waxy or glossy

petiole: very short, smooth, hard, with boat shaped groove

stem: very smooth, hard, and round

almost succulent with prominent nodes

Propagated by leaf or stem cuttings.

42. Philodendron micans - Velvet leaf philodendron

leaf: simple, opposite, entire; distinctly heartshaped

smooth and velvety soft; veins prominent on underside

tapers to a long pointed tip

petiole: round, smooth, fairly short

stem: very round and smooth

vining with roots forming along the stem

Propagated by stem cuttings.

43. Philodendron oxycardium - Heartleaf philodendron

leaf: simple, alternate, entire

broad, heartshaped with a long pointed tip

smooth, in juvenile stage may be velvety

glossier when mature

petiole: smooth, round, about 1 to 2"

stem: round, smooth

a twining or trailing vine

May root or grow in water for some time. Propagated by stem cuttings.

44. Pilea cadierei - Aluminum plant

leaf: simple, opposite, mostly entire with notches near tip

smooth, thin oval with pointed tip

quilted with 3 conspicuous sunken veins - one on

either side and parallel to the midrib

petiole: short, about 1", smooth

stem: round, not real smooth

erect growth

Propagated by stem cuttings or root division.

45. Pilea nummulariaefolia - Creeping Charlie

leaf: simple, opposite, entire

slightly fuzzy or hairy, soft; quilted

round, very small - less than 1"

petiole: same length as leaf

hairy, round, soft

stem: tender, fuzzy, soft; roots at nodes

covered with tiny short hairs

Good for terrariums and hanging baskets. Propagated by stem cuttings.

46. Platycerium bifurcatum - Staghorn fern

leaf: simple, large



leathery with rough, dry texture

fertile fronds pendant, twice long forked

deeply lobed resembling deer antlers

edges smooth - not serrated

sterile or basal fronds are rounded to kidney shaped,

overlapping and feathered in back; may become

dry and leathery

An air growing or epiphytic plant which naturally grows on tree bark; it is best displayed in hanging containers.

Propagated from small plants (pups) growing along basal fronds, or from spores produced on the tip of the fertile frond.

47. Plectranthus australis - Swedish ivy

leaf: simple, opposite, 1 to 2" in size

round, shallowly scalloped or serrated

slightly thickened; veins prominent on underside

leathery, very waxy

petiole: short, smooth, square

stem: smooth, soft and flexible, square

drooping habit of growth

flower: small, delicate, 2 lipped, trumpet shaped

found on a tall spike

Fast growing, good for hanging baskets. Propagated by stem cuttings.

48. Rosa hybrida - Rose

leaf: compound, alternate

leaflet: small, oval with pointed tip

3 to 7 leaflets per leaf arranged oppositely with 1 at tip

dull but smooth; midrib prominent underneath

petiole: short, smooth; flattens out close to stem

stem: smooth except rough on older tissue

round, thorns arranged irregularly along stem

bud: at tip of stem, smooth, soft

flower: sepals and petals in 5's

petals soft and powdery, tips curling downward when open

Most have pleasant fragrance. Propagated by stem cuttings.

49. Saintpaulia ionantha - African violet

leaf: simple, entire (some species may have wavy margins)

hairy or pubescent; mostly small, broad oval

petiole: long, thick, brittle

stem: stemless, petioles arising from the crown

flower: small, smooth to ruffled

5 petaled single or many petaled doubles

May be the most popular flowering houseplant in America.

Propagated by seed, leaf cuttings, or crown divisions.

50. Sansevieria trifasciata - Snake plant

leaf: simple, entire, upright

emerge from ground in clumps

long, lancelike, about 2" wide

smooth, thick, leathery, and stiff

has a spiky or very pointed tip

A tough, hardy, houseplant. Propagated by division or leaf cuttings.

51. Sansevieria trifasciata 'Hahnii' - Bird's nest sansevieria

leaf: simple, entire; forms vaselike rosette

spirally arranged and flexed backwards

radiate up and out from base

thick, smooth, leathery

has a pointed tip like short triangles

Propagated by division or leaf cuttings.

52. Saxifraga sarmentosa - Strawberry Geranium, Strawberry Begonia

leaf: simple, in small dense tufts

mostly round with scalloped edges

rough and very fuzzy especially on the top

soft and fleshy

petiole: rough, fuzzy; twice as long as leaf blade

Good for terrariums, small hanging baskets, and rock plants.

Propagated from plantlets forming at the end of threadlike

runners similar to a strawberry plant.



53. Schlumbergera bridgesii - Christmas cactus

leaf: simple, leaflike joints which are rectangular oblongs

much branched, smooth with prominent midrib

margins slightly wavy

flower: appear from ends of younger joints

3" long hooded tubular

Good for hanging baskets. Propagated by seed, or stem cuttings.

Note: The Thanksgiving cactus, Zygocactus truncatus, is similar except is notched near the apex of each joint with two prominent teeth or claws.

54. Sinningia speciosa - Gloxinia

leaf: simple, slightly serrated or toothed

round to oblong; large 4 to 6"

soft and velvety; midrib and veins prominent on underside

petioles: long and round with boat shaped groove

hairy, soft

stem: nearly stemless

flower: large, trumpet or bell shaped

usually with 5 lobes, may droop

Propagated by leaf cuttings or seeds.

55. Spathiphyllum commutatum 'Clevelandii' - Spathiphyllum, Peace Lily

leaf: simple, entire, fairly large and narrow

long, smooth, slick, flexible

midrib prominent on underside

tends to droop and arch

petiole: round, smooth, coming singly from the ground

wiry

flower: on a tall reedlike smooth stem

bloom resembles a tiny, hard ear of corn

backed by a leaf (spathe) which seems to be wrapped

around the stem

Propagated by root division.

56. Syngonium podophyllum - Nephthytis, African evergreen, Arrowhead plant

leaf: simple, thin, smooth

margin is smooth, with long tapering tip

arrowhead shaped with three distinct lobes

in later stages may be palmately divided into 5 to 9 segments

prominent midrib

petiole: round, smooth, very long

leaf base appears wrapped around petiole

stem: very short, smooth

Can be trained to hang, climb, or grow upright with supports.

Propagated by stem cuttings.

57. Zebrina pendula - Wandering jew

leaf: simple, alternate, entire

wrapped around the stem with a sheath as if the stem passes

through the leaf - no petioles

sheath soft and hairy; midrib prominent on underside

long pointed oval; slightly succulent-like

stem: very smooth, round, firm

almost succulent, forms roots at nodes

Vining type growth habit, therefore good for hanging baskets.

Propagated by stem cuttings. Purple under the leaf.

Note: Tradescantia flumeninsis also carries the common name of wandering jew. It is usually solid green or variegated. The two plants are very similar otherwise.

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The South Carolina Agricultural Experiment Station,  
Clemson University, Clemson, South Carolina

L. P. Anderson  
Dean of Agricultural Sciences

W. C. Godley  
Associate Dean & Director  
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